

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

CORRECTED

|   |   |  |
|---|---|--|
| Applicant's or agent's file reference<br>104023-664-PCT | <b>FOR FURTHER ACTION</b> <small>see Form PCT/ISA/220 as well as, where applicable, item 5 below.</small> |  |
| International application No.<br>PCT/US04/40197         | International filing date (day/month/year)<br>01 December 2004 (01.12.2004)                               | (Earliest) Priority Date (day/month/year)<br>02 December 2003 (02.12.2003) |
| Applicant<br>GREAT WALL SEMICONDUCTOR CORPORATION       |   |  |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 8 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the Report

- a. With regard to the language, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

- b. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box No. II)3. ☐ Unity of invention is lacking (See Box No. III)

## 4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

## 5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

## 6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 2A

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/40197

## Box IV TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

## NEW ABSTRACT

There is provided herein exemplary embodiments of a semiconductor device constructed in accordance with the present invention. The device comprises: a semiconductor chip (105) having a lateral power transistor formed therein. The chip (105) has an upper surface and source, drain and gate contact terminals on the upper surface thereof. Each of the source, drain and gate contact terminals have a conductive ball (106) or pillar thereon. A metal lead frame (110) spans the upper surface of the chip, the metal lead frame (110) being in electrical contact with the conductive balls or pillar bumps. A capsule (115) encases the chip (105) and at least a portion of the metal lead frame (110) such that opposite ends of the metal lead frame protrudes from opposite sides of the capsule (115).

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/40197

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: H01L 23/48( 2006.01)

USPC: 257/666,676,737,738,778

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 257/666, 676, 737, 738, 778

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EAST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                             | Relevant to claim No. |
|------------|--|-----------------------|
| X          | US 5,945,730 A (SICARD et al) 31 August 1999 (31.08.1999), column 2, lines 37-50, column 3, line 13, Figure 2. | 1-25                  |
| A          | US 6,861,702 A (KITAMURA) 1 March 2005 (01.03.2005)  |                       |
| A          | US 6,674,157 A (LANG) 6 January 2004 (06.01.2004)  |                       |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z"

document member of the same patent family

Date of the actual completion of the international search

13 April 2006 (13.04.2006)

Date of mailing of the international search report

21 NOV 2006

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (571) 273-3201

Authorized officer

Roy Potter

Telephone No. 571 272 1842

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY.

To:  
RICHARD I. SAMUEL  
GOODWIN PROCTER LLP  
103 EISENHOWER PARKWAY  
ROSELAND, NJ 07068

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

|   |  |   |  |
|---|--|---|--|
| Date of mailing<br>(day/month/year)   |  | 21 NOV 2008                                 |  |
| Applicant's or agent's file reference   |  | FOR FURTHER ACTION<br>See paragraph 2 below |  |
| 104023-664-PCT  |  |   |  |
| International application No.   | International filing date (day/month/year) | Priority date (day/month/year)              |  |
| PCT/US04/40197  | 01 December 2004 (01.12.2004)              | 02 December 2003 (02.12.2003)               |  |
| International Patent Classification (IPC) or both national classification and IPC |  |   |  |
| IPC: H01L 23/48( 2006.01)   |  |   |  |
| USPC: 257/666,676,737,738,778   |  |   |  |
| Applicant   |  |   |  |
| GREAT WALL SEMICONDUCTOR CORPORATION  |  |   |  |

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

## 3. For further details, see notes to Form PCT/ISA/220.

|   |   |  |
|---|---|--|
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (571) 273-3201 | Date of completion of this opinion<br>17 November 2008 (17.11.2008) | Authorized officer<br>Zandra Smith<br>Telephone No. 571 272 1850 |
|---|---|--|

Form PCT/ISA/237 (cover sheet) (April 2007)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US04/40197

## Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
- ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).
3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:
- a. type of material
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in electronic form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US04/40197

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

|                               |             |     |
|-------------------------------|-------------|-----|
| Novelty (N)                   | Claims 1-25 | YES |
|                               | Claims NONE | NO  |
| Inventive step (IS)           | Claims NONE | YES |
|                               | Claims 1-25 | NO  |
| Industrial applicability (IA) | Claims 1-25 | YES |
|                               | Claims NONE | NO  |

2. Citations and explanations:

Claims 1 - 25 lack an inventive step under PCT Article 33(3) as being obvious over Sicard. et al.

Sicard et al. discloses a semiconductor device. As described in column 2, line 37, the device is a lateral double diffused metal oxide (LDMOS) power transistor. Drain and source regions are contacted by metal conductors 4 and 6 respectively. Metal bumps 8 are formed on the upper surface of the semiconductor chip and connect the metal conductors 4 and 6 of the source and drain to a lead frame 14 which is described in column 3, line 19. Figure 6 shows the gate of the LDMOS of the chip. Figure 3 shows the source and drain portions 16 and 18 of the frame extending in opposite directions. The bumps 8 are described as being formed of copper or an alloy of copper, tin and lead in column 2, line 51.

Claims 1-25 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.